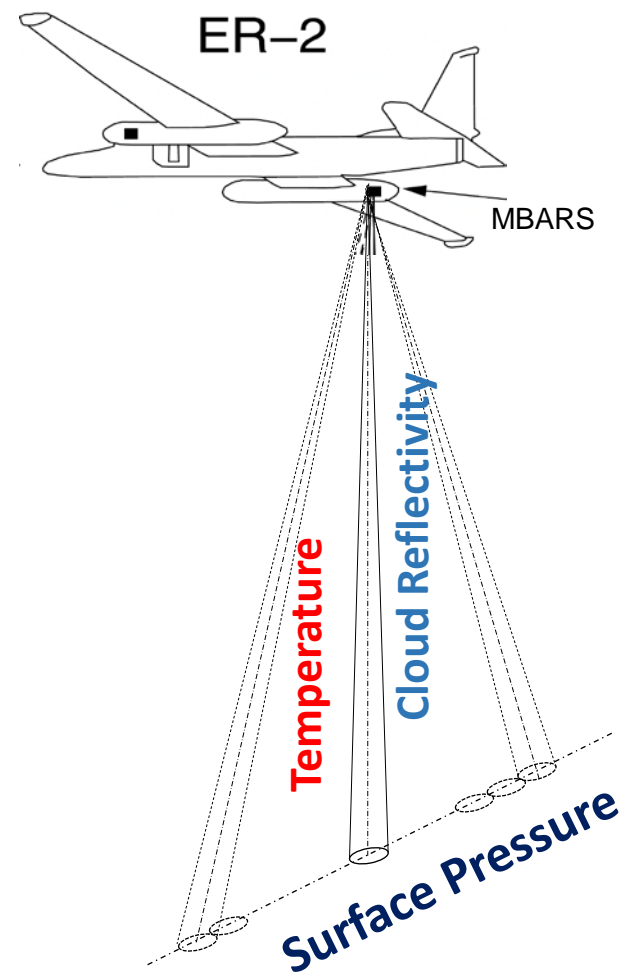


Observing System Simulation Experiments to Determine the Impact of Spaceborne Differential Absorption Radar Measurements of Marine Surface Pressure on Numerical Weather Prediction

Nikki Privé, Matt McLinden, Bing Lin, Gerry Heymsfield,
Steve Harrah, Lihua Li, and Xia Cai



- Combined active/passive microwave instrument at V-band (64-70 GHz)
- Retrieve surface pressures
- Airborne flights in 2024





- Evaluate the potential impact of spaceborne radar measurements of marine surface pressures on numerical weather prediction (NWP)
- Trade space experiments for instrument requirements

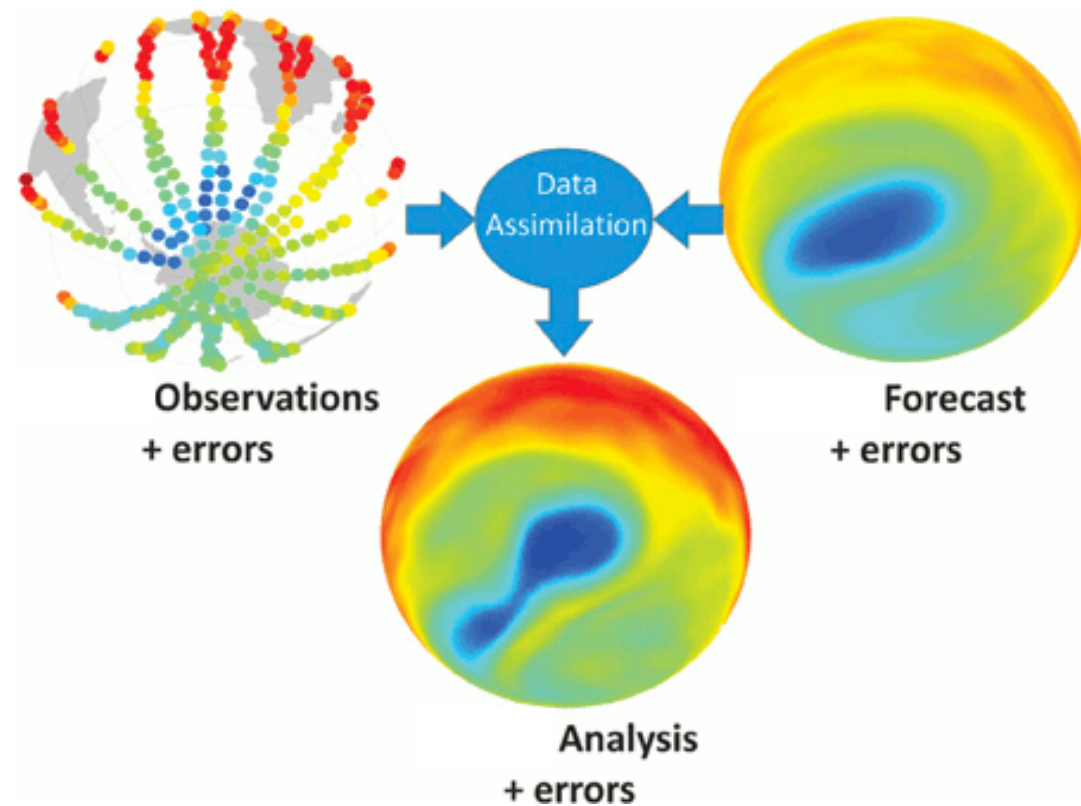
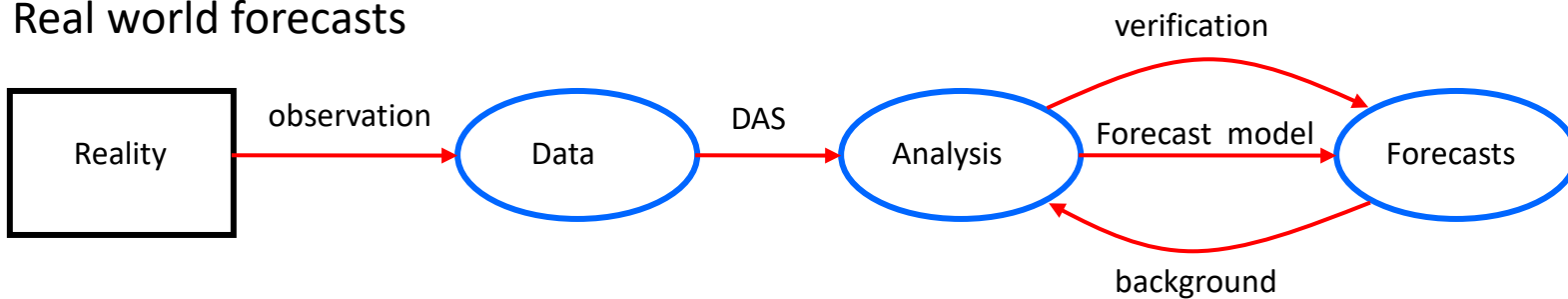


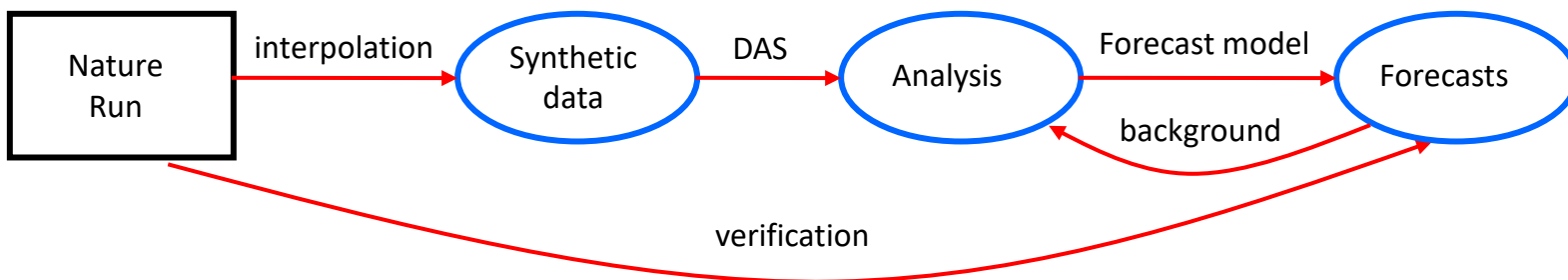
Image: Lahoz, W. and P. Schneider, Front. Environ. Sci., 2014, with permission



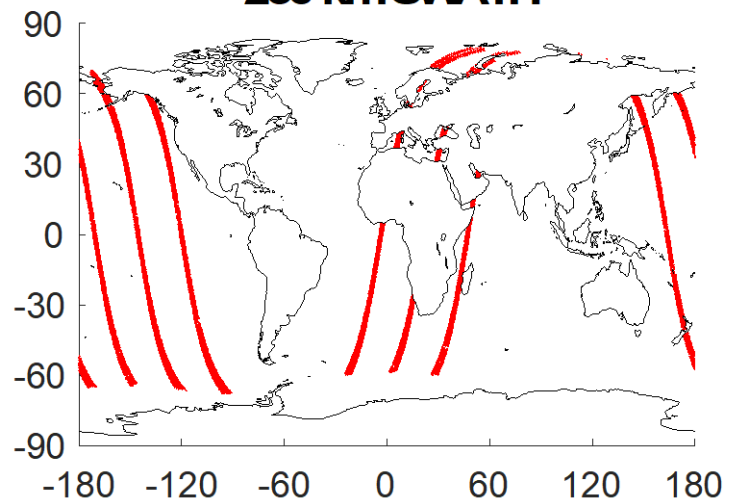
Real world forecasts



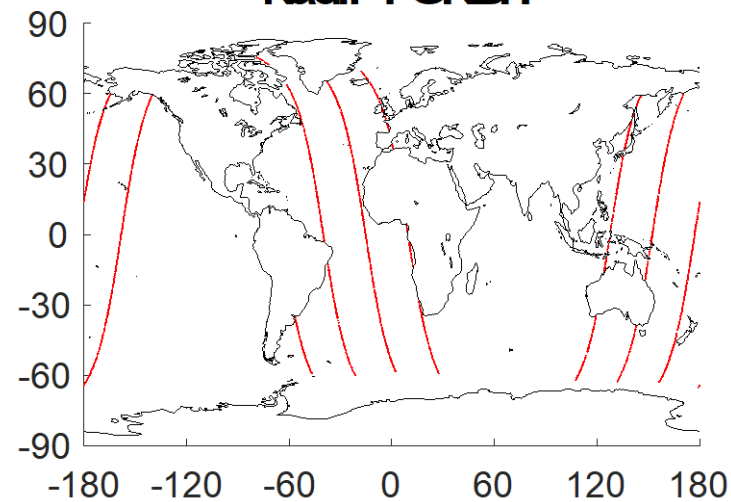
OSSE forecasts



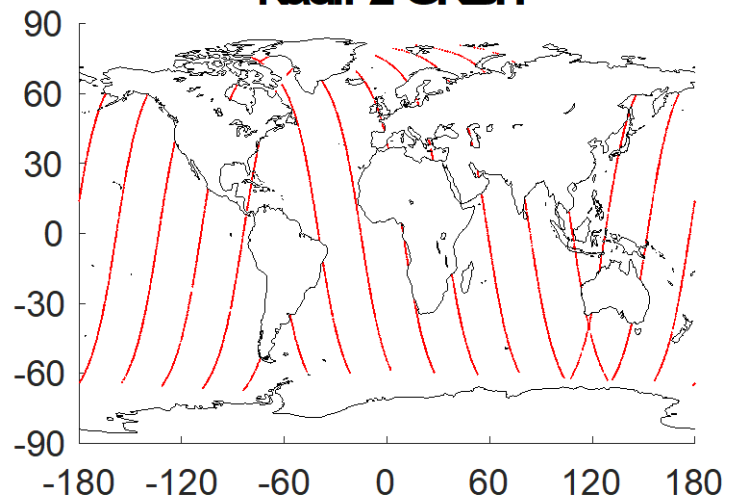
250 km SWATH



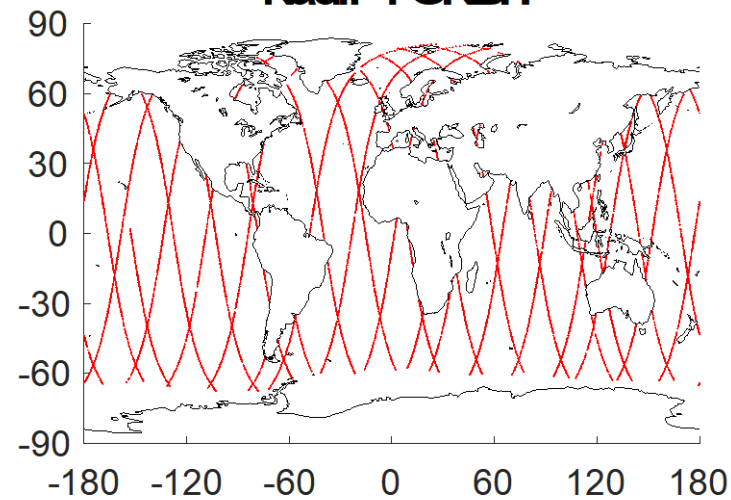
Nadir 1-ORBIT



Nadir 2-ORBIT



Nadir 4-ORBIT

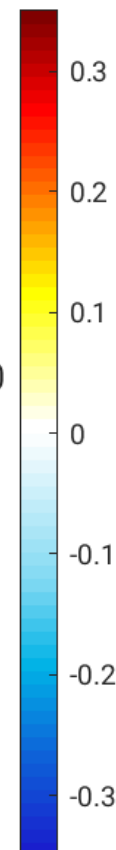
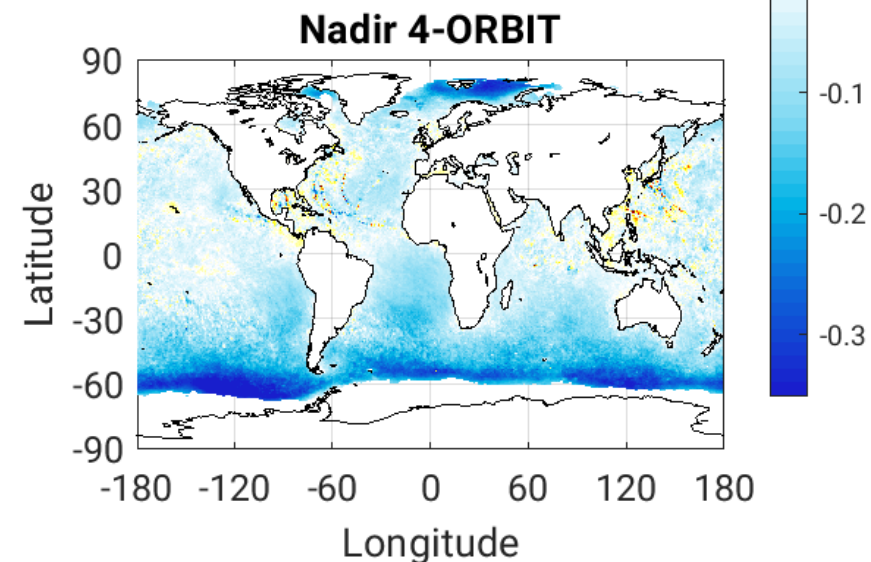
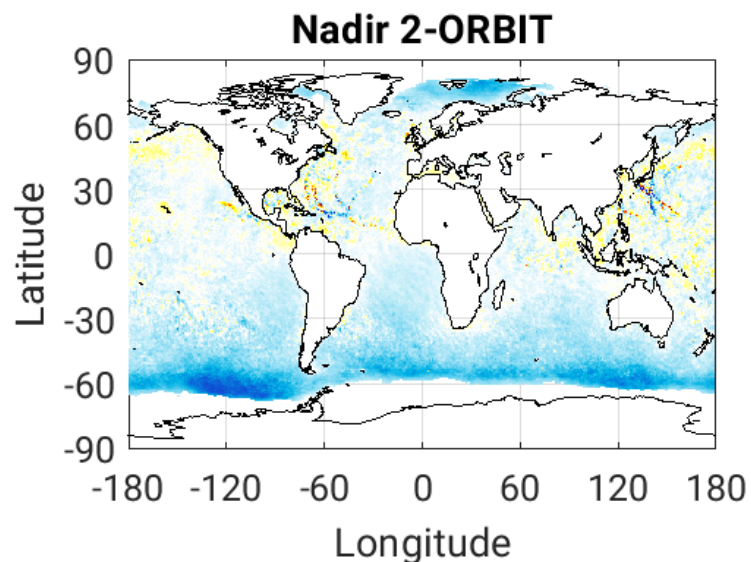
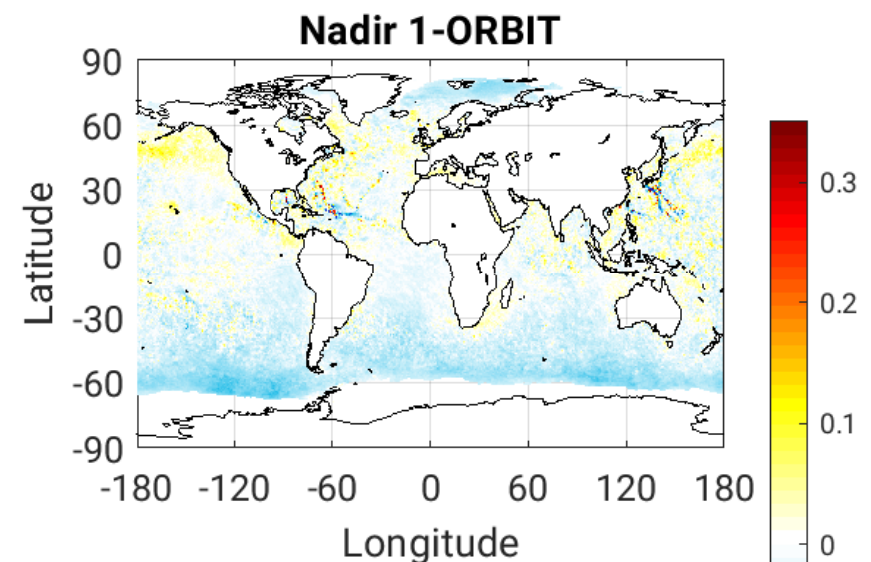
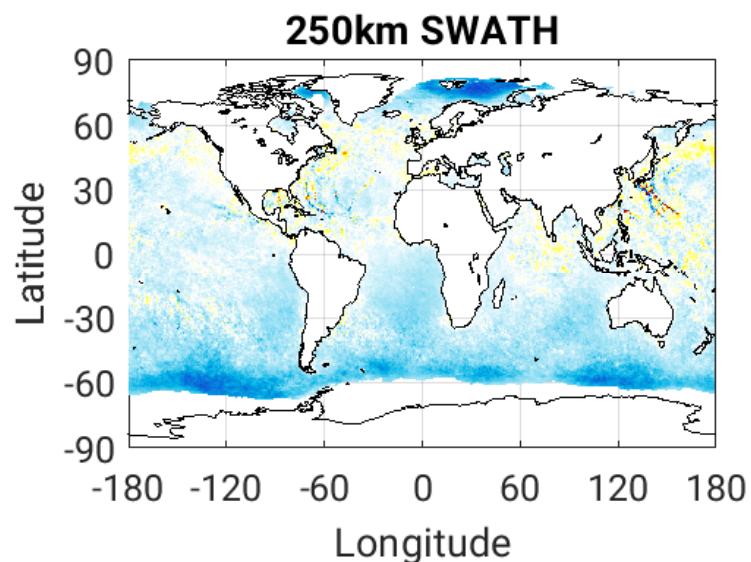


BLUE = Beneficial

YELLOW = Degradation

Control = no radar

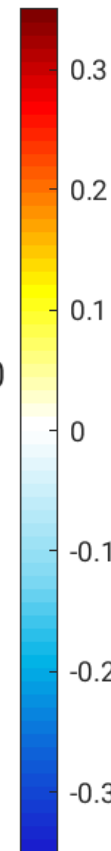
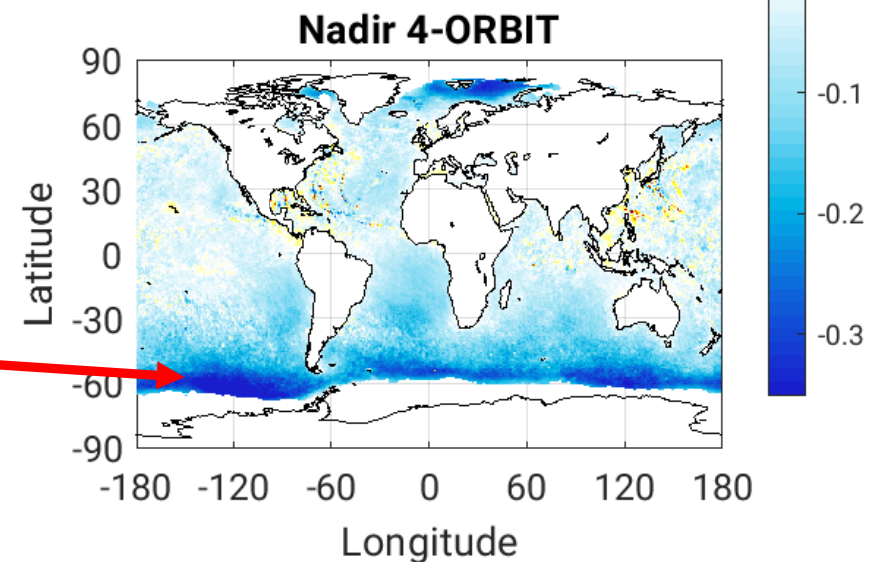
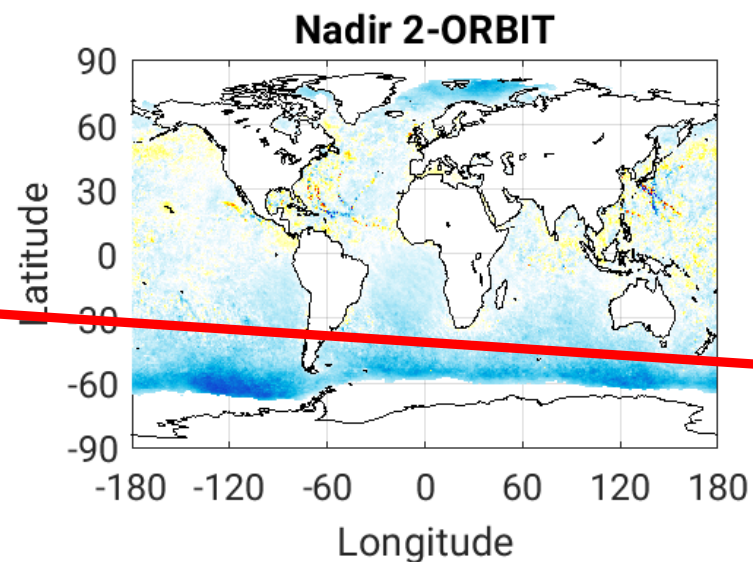
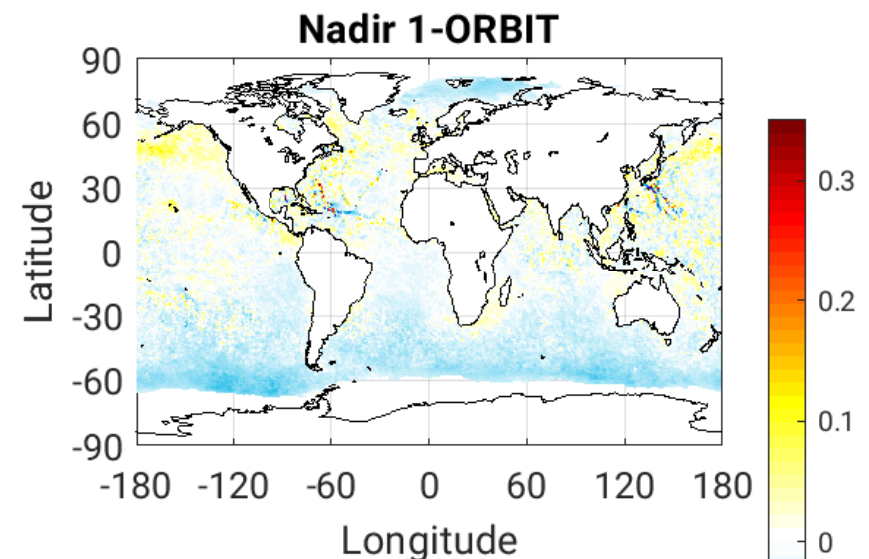
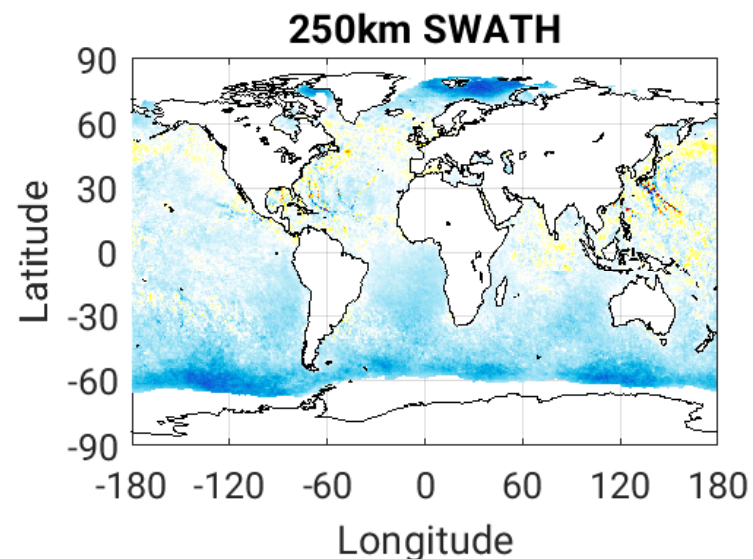
Fractional difference in
surface pressure RMSE



BLUE = Beneficial

YELLOW = Degradation

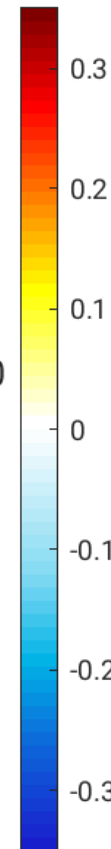
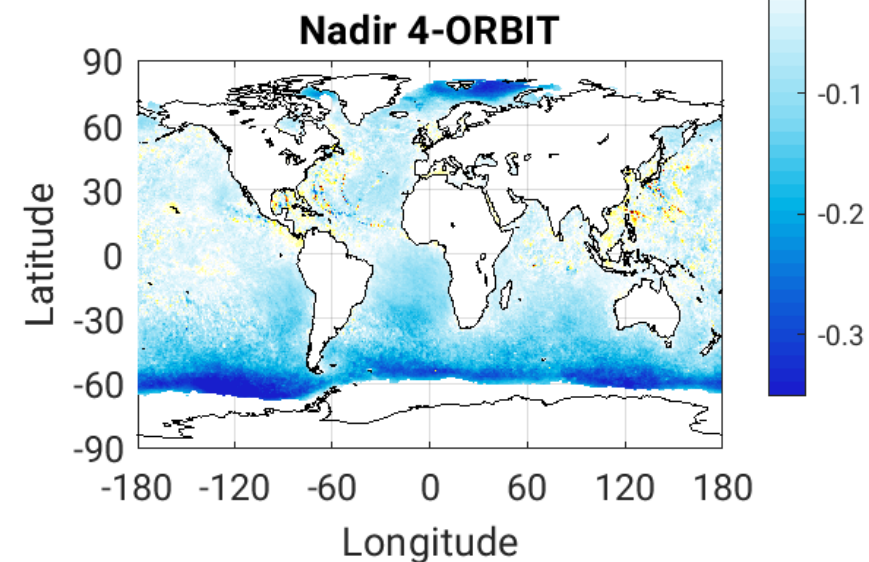
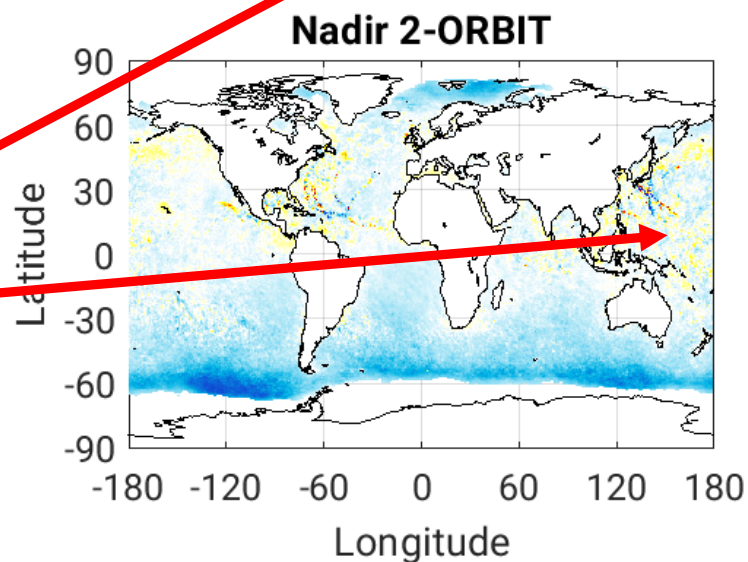
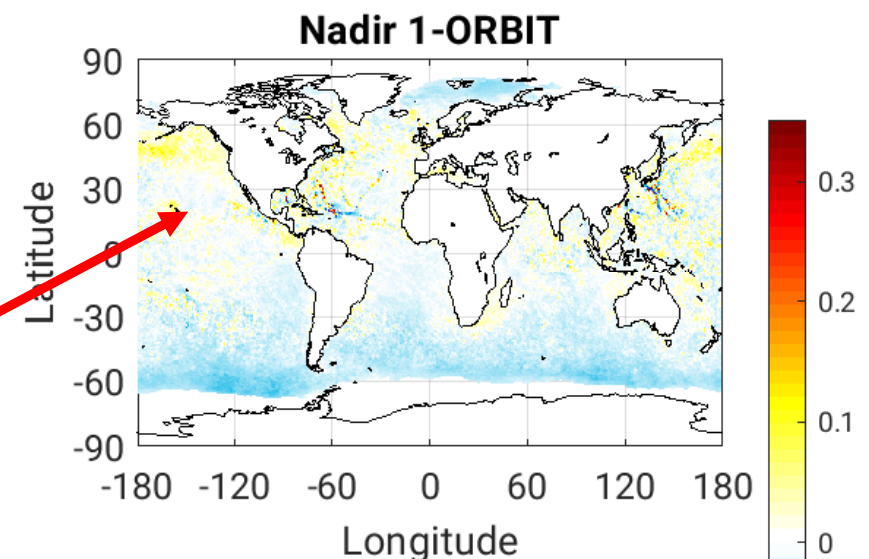
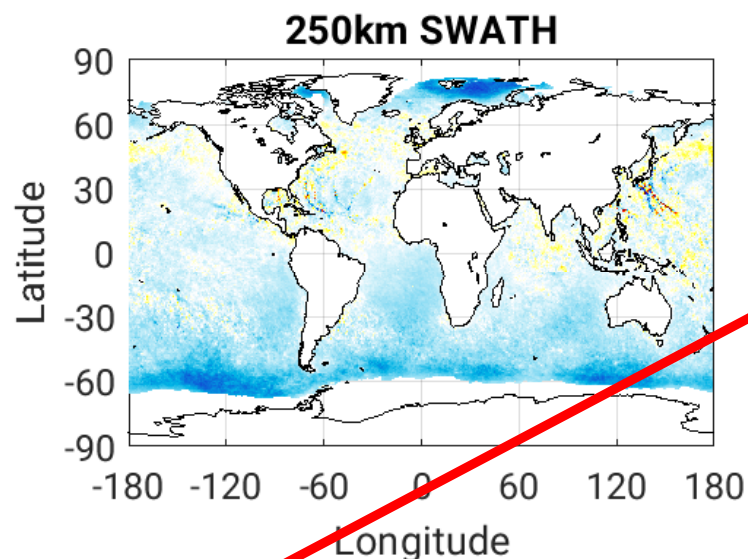
> 30% localized
improvement



BLUE = Beneficial

YELLOW = Degradation

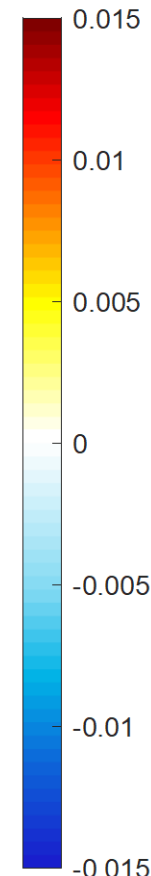
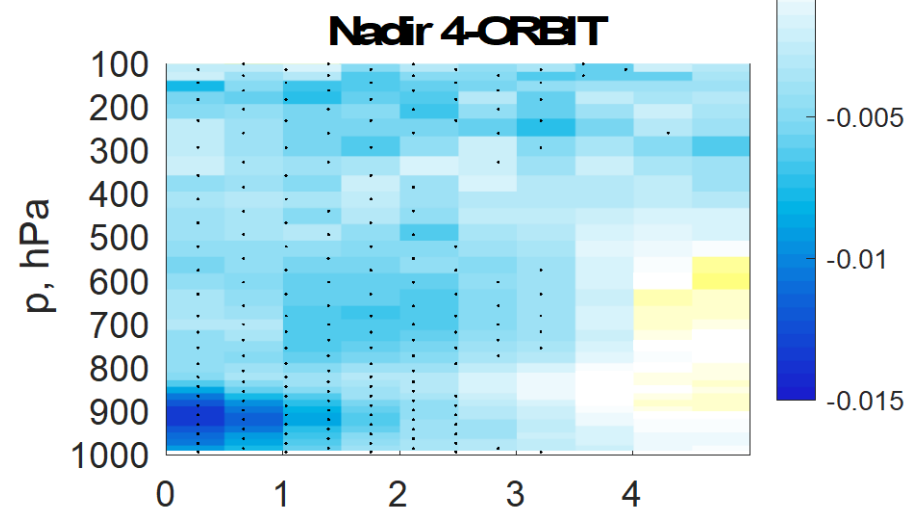
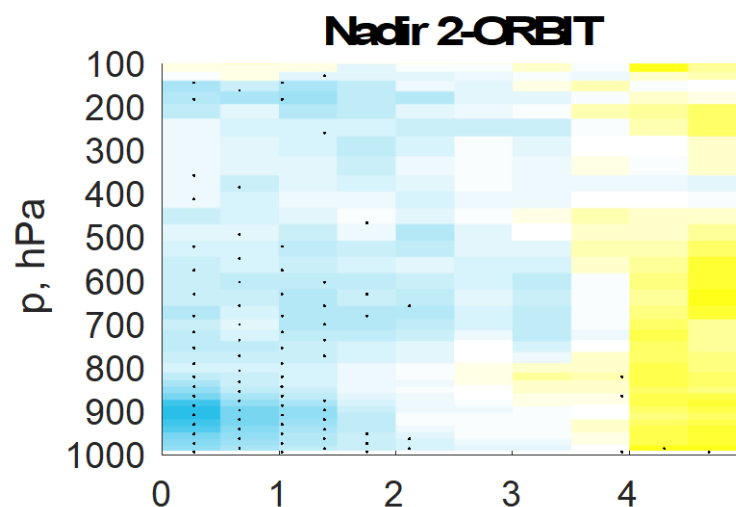
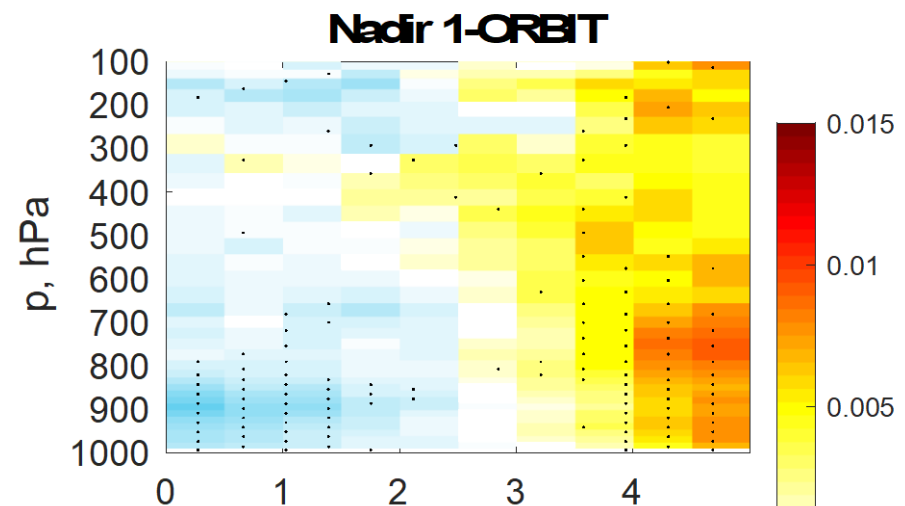
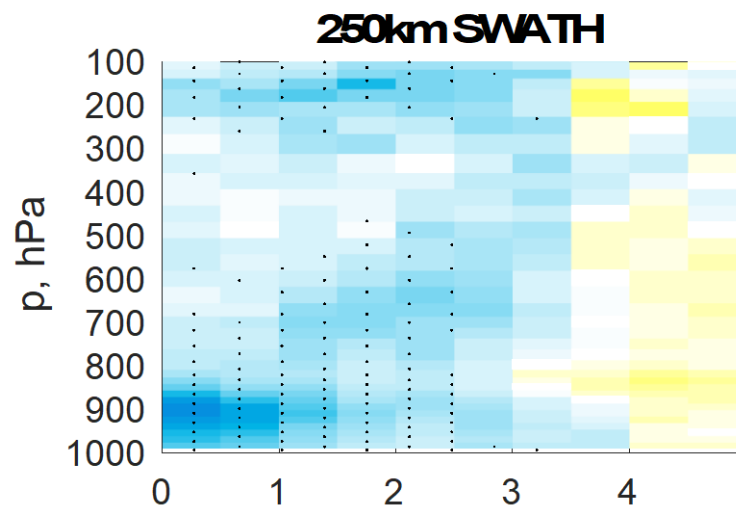
Degradation –
model feedback



BLUE = Beneficial

YELLOW = Degradation

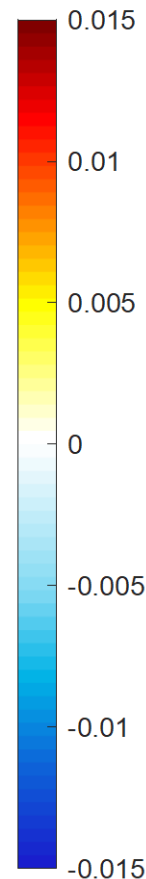
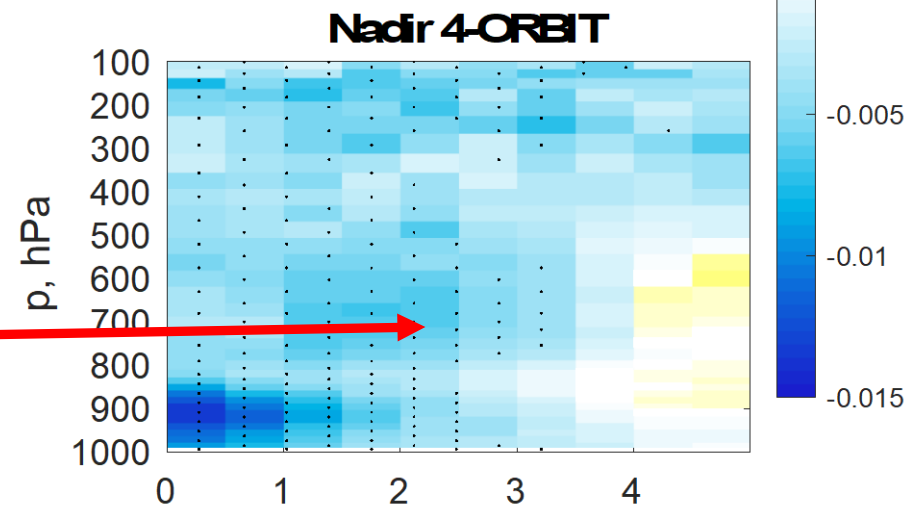
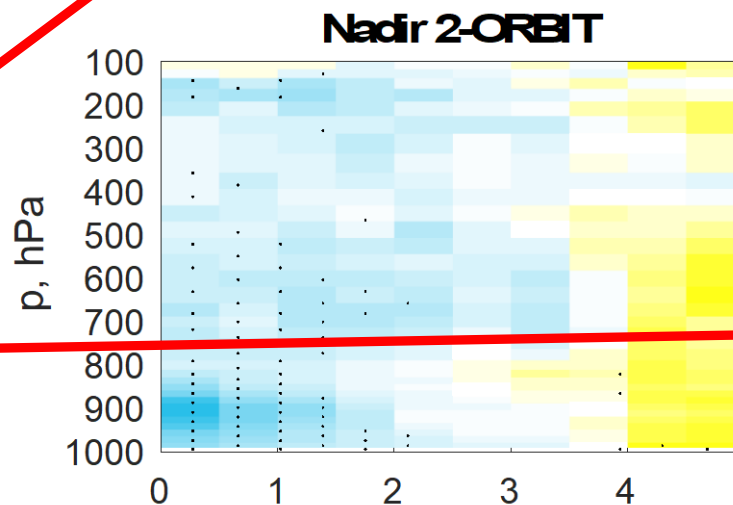
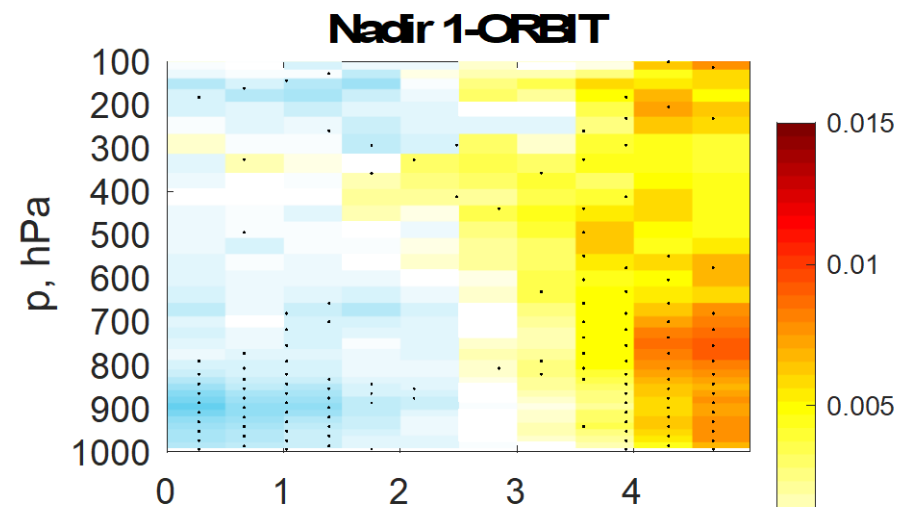
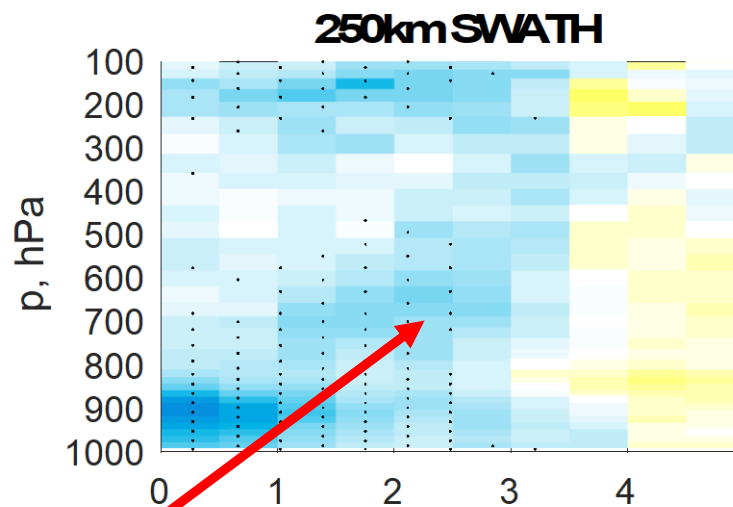
Fractional difference in
T forecast RMSE,
20S-90S



BLUE = Beneficial

YELLOW = Degradation

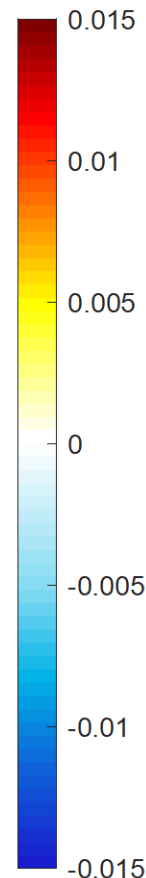
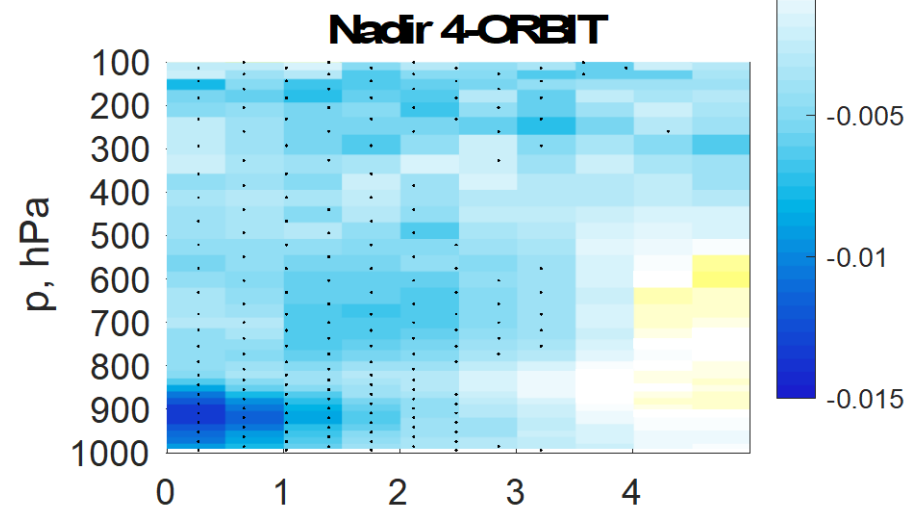
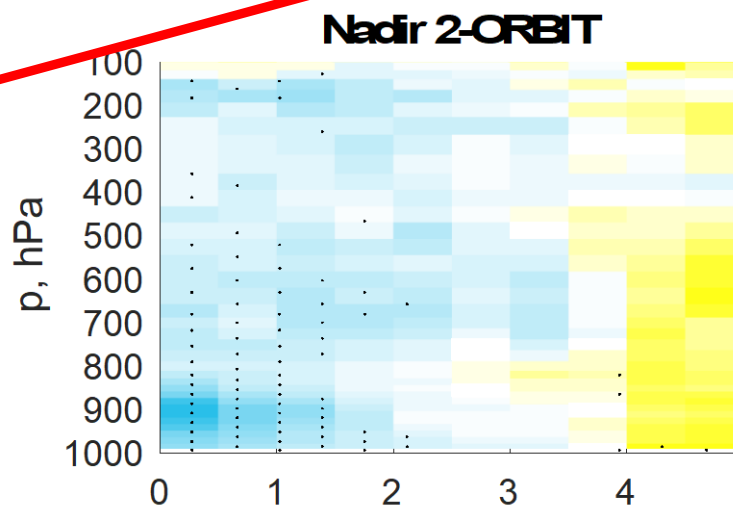
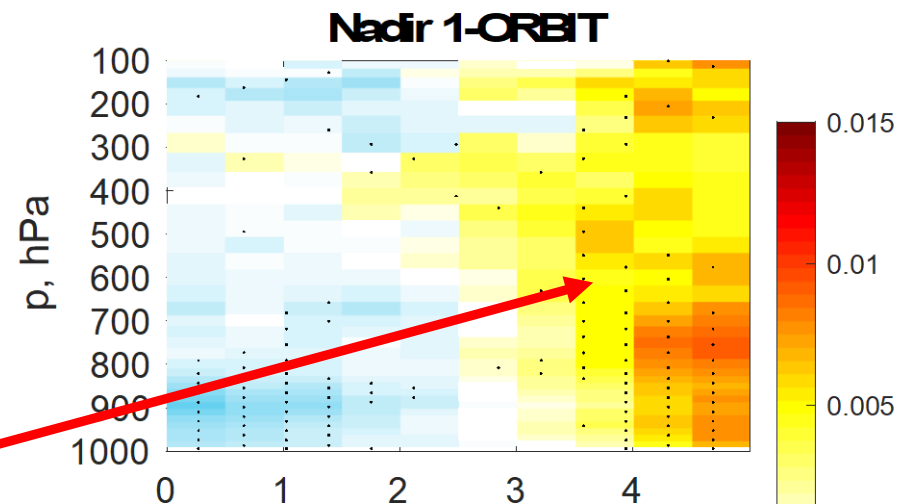
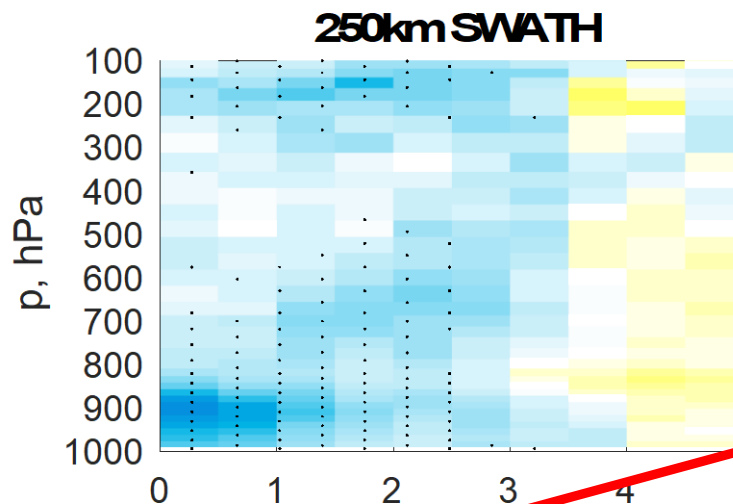
Improvement
48-72 hours



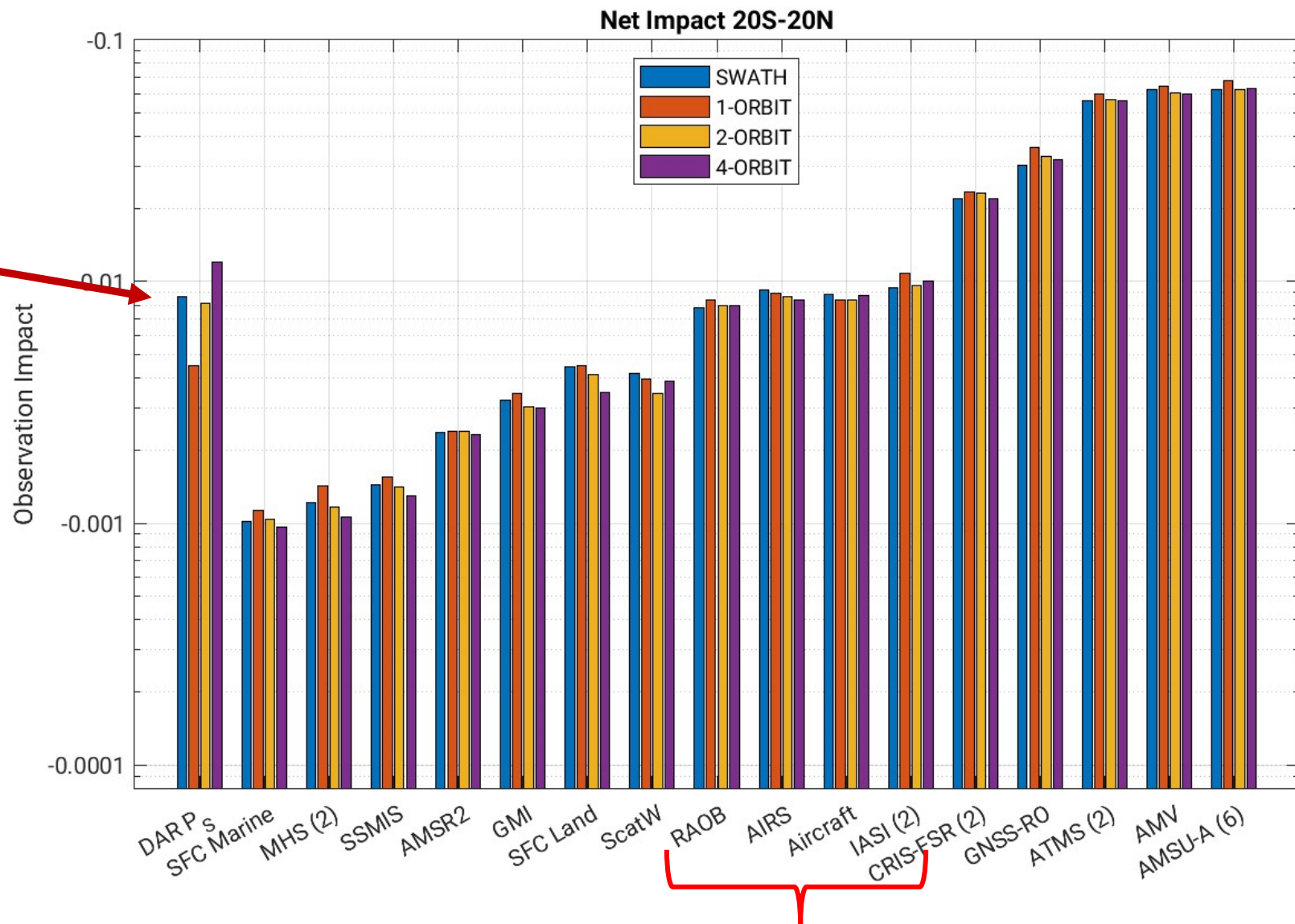
BLUE = Beneficial

YELLOW = Degradation

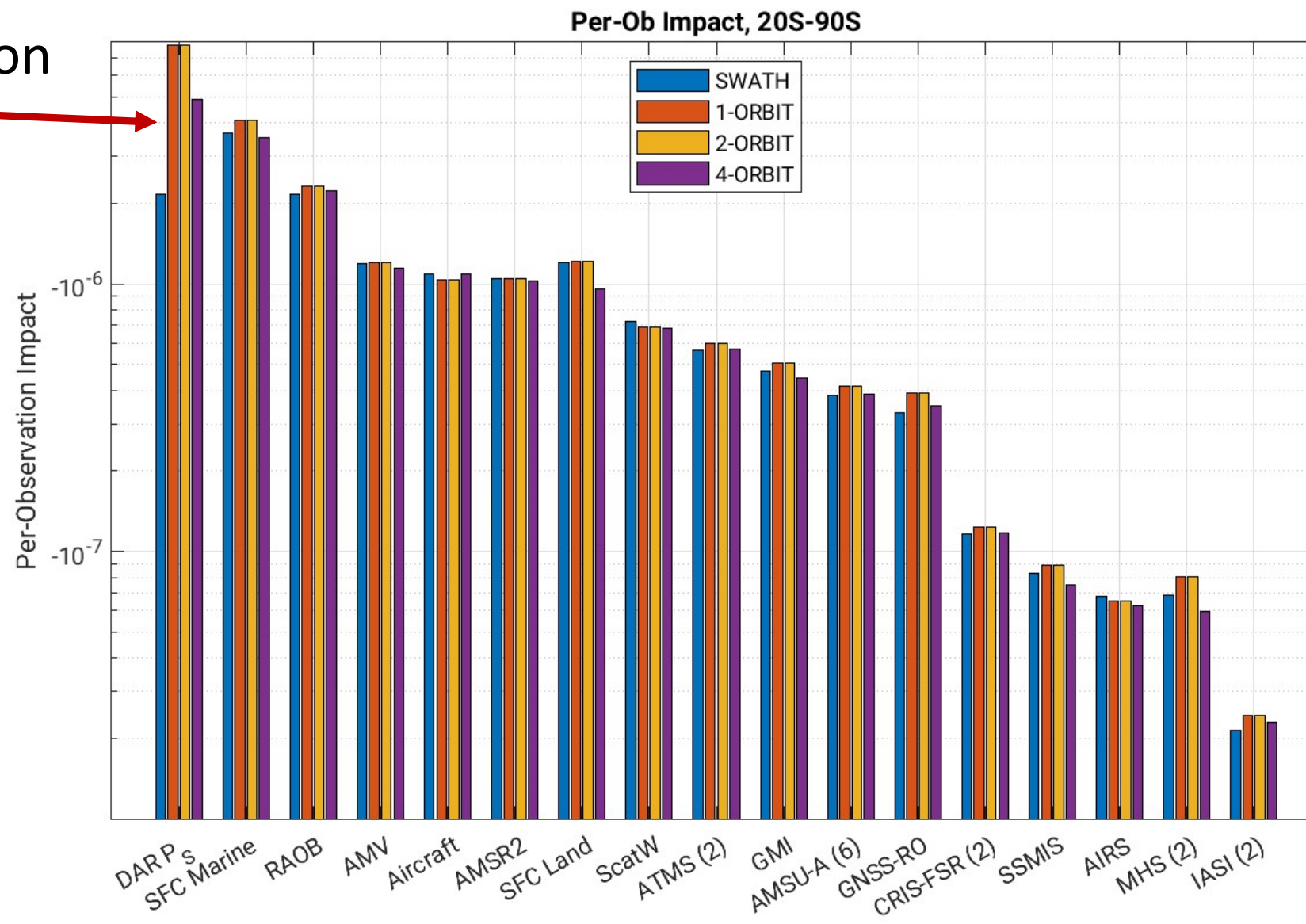
Delayed model
feedback?



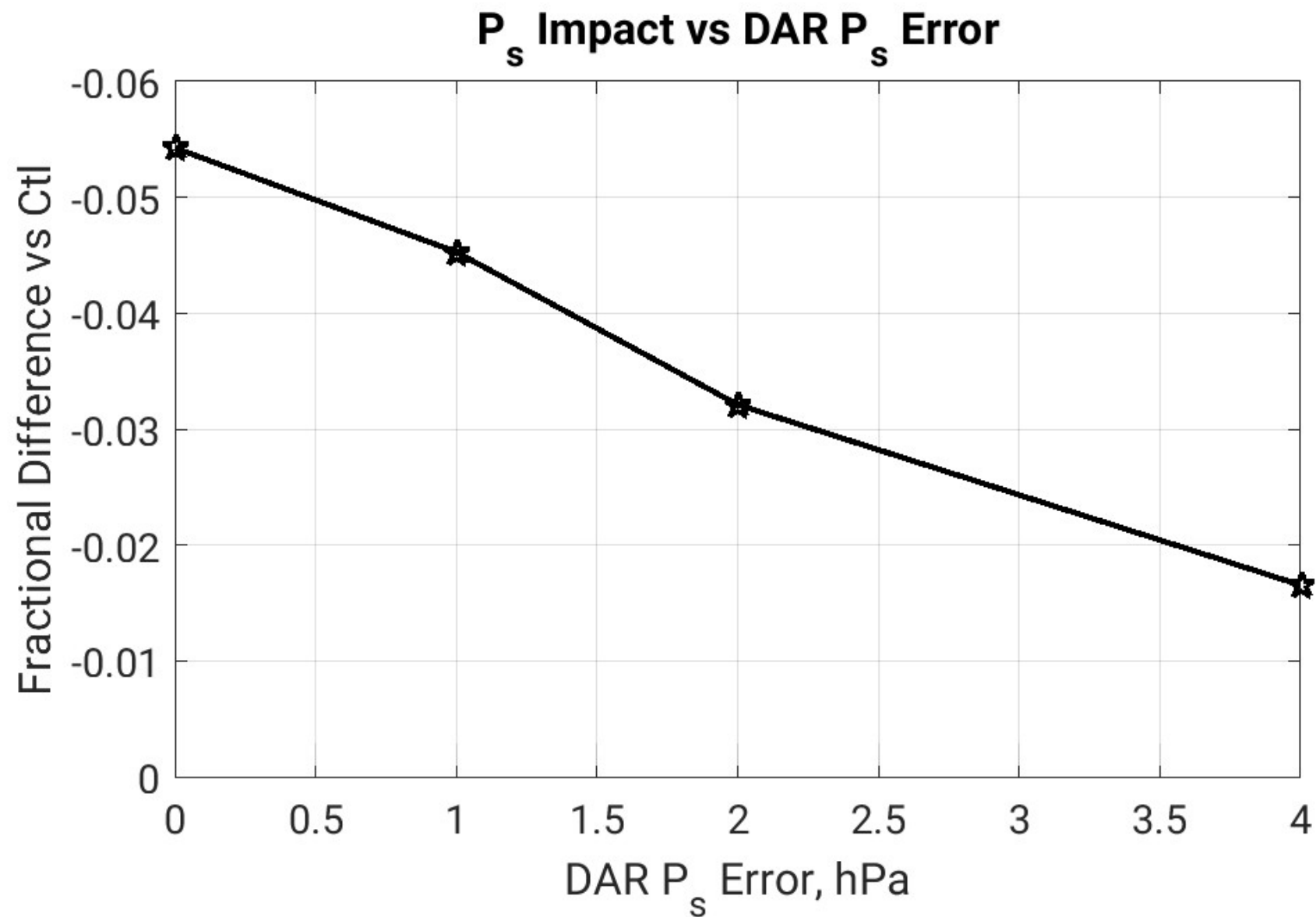
Total impacts on par
with rawinsondes,
aircraft, AIRS, and
IASI



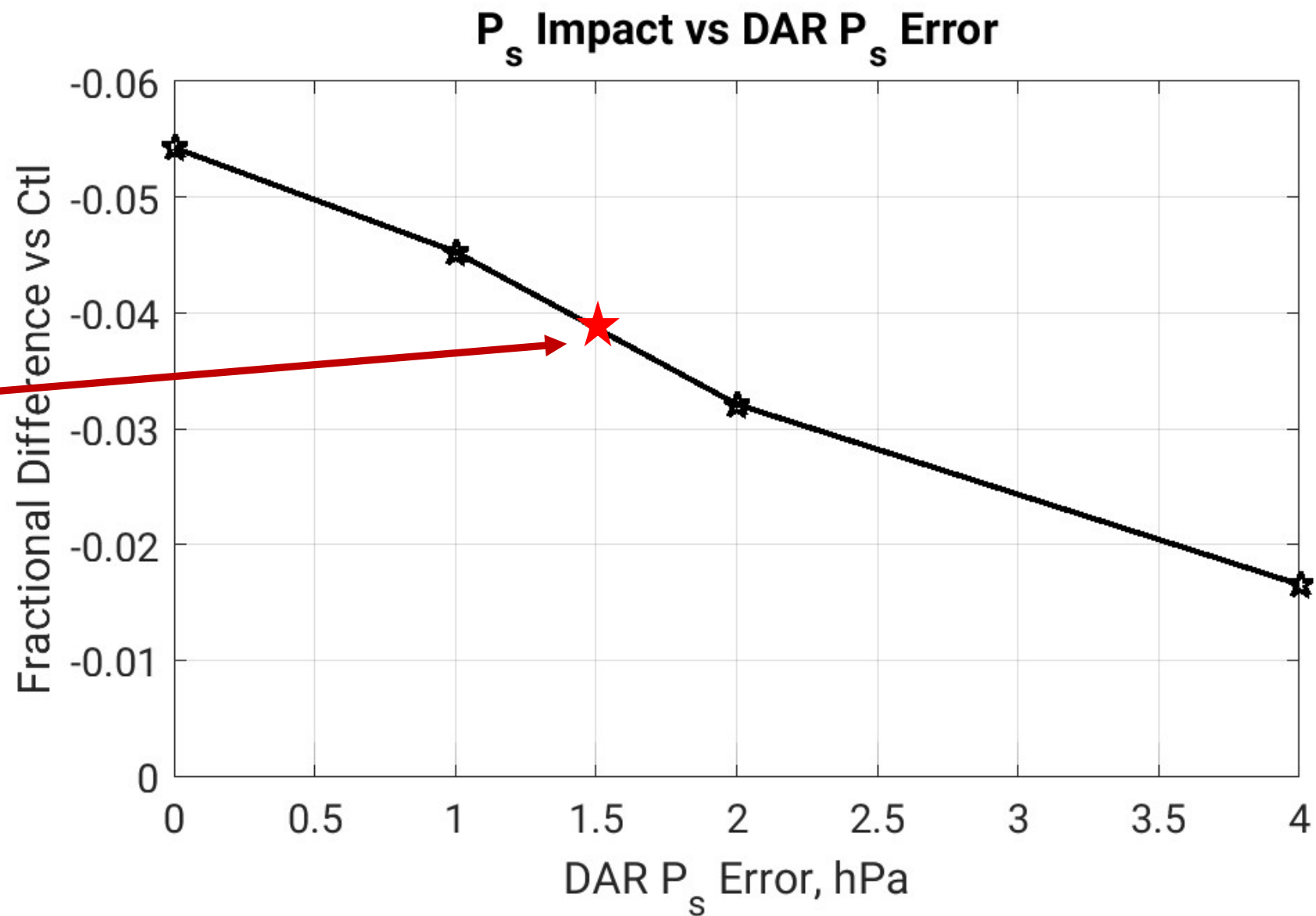
Large per-observation
impacts



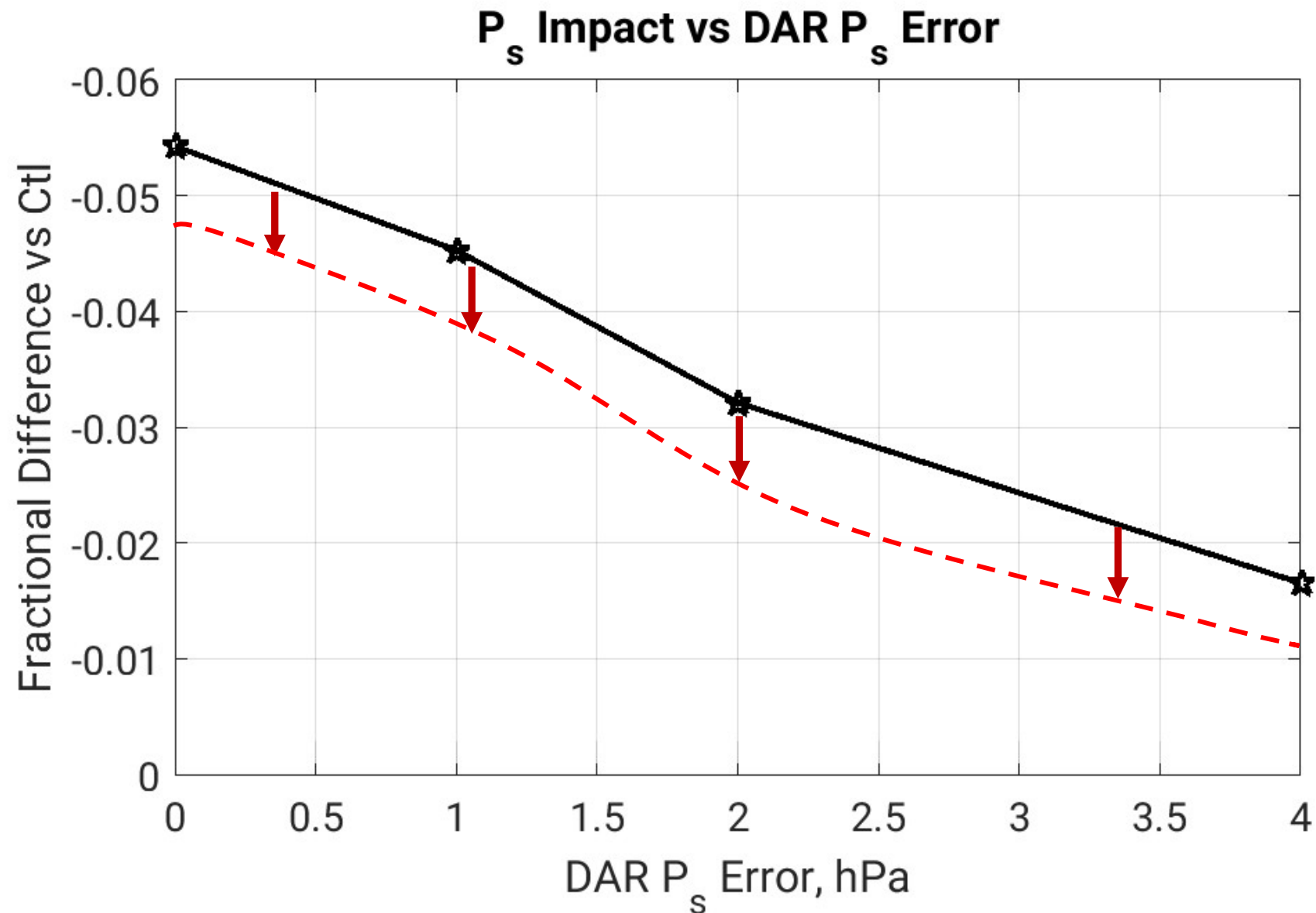
Added random
DAR P_s errors



OSSE tests,
approximate



Correlated obs
errors - expected
effects

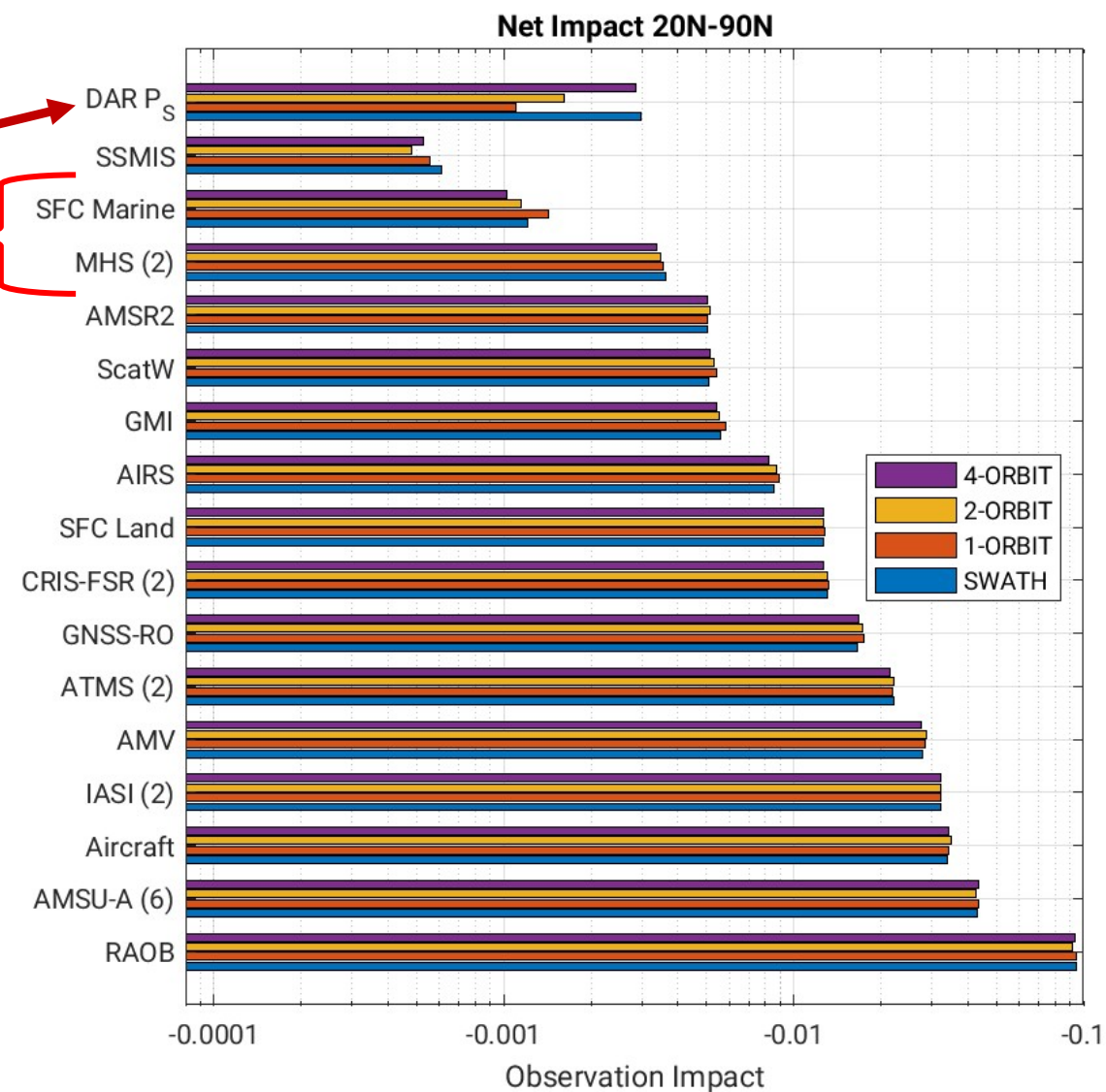


- Nadir 4-satellite constellation outperforms single scanning orbit
- Observation impacts greatest in the extratropics
- Beneficial impacts seen with a broad range of observation errors

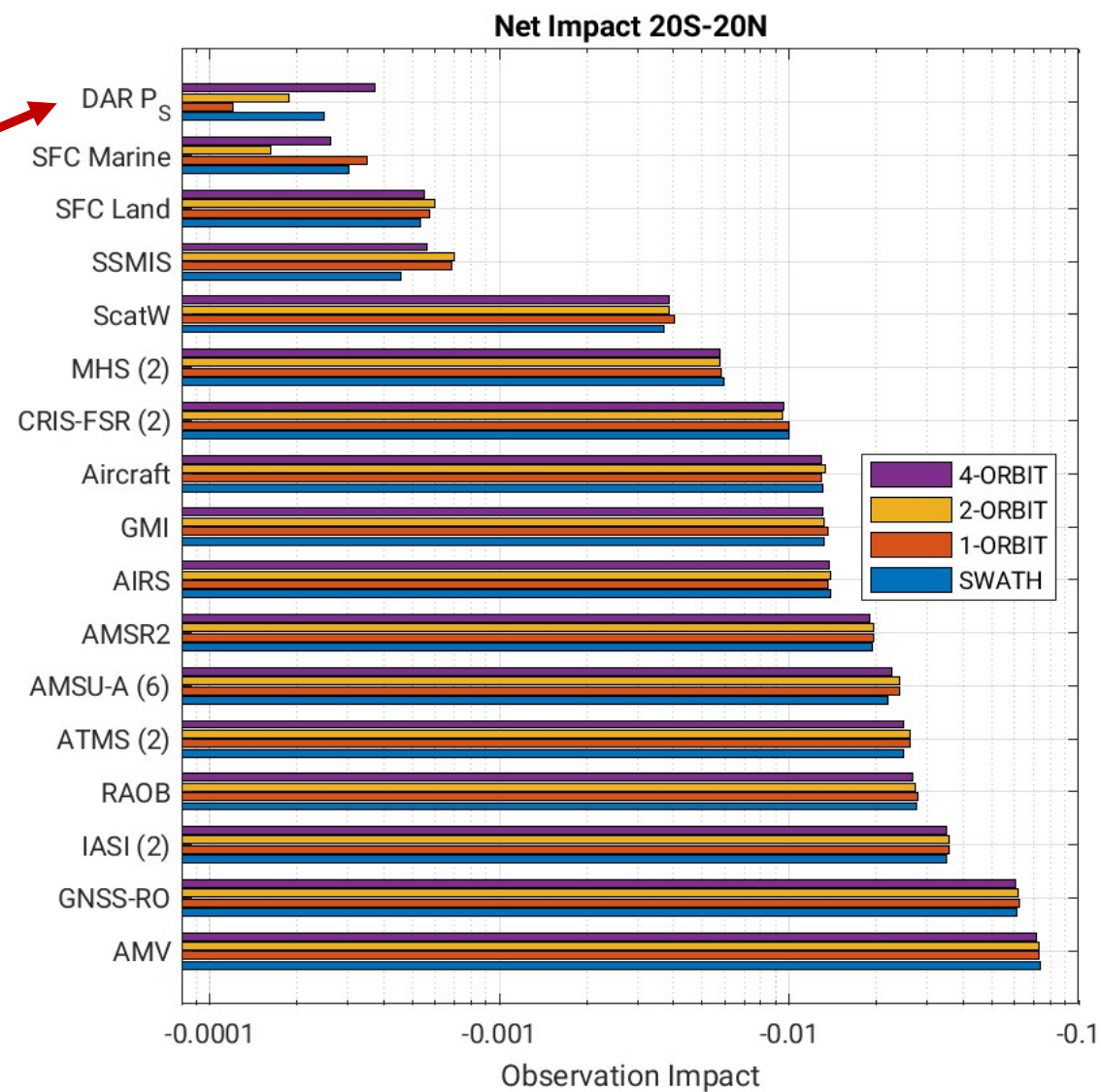


Extra Slides

Total impacts on par
with ships/buoys and
MHS



Total impacts on par
with ships/buoys



Reasonable impact
for the range of
expected
observation error
(1-2 hPa)

